



PYRAMID GEOPHYSICAL SERVICES
(PROJECT 2017-253)

GEOPHYSICAL SURVEY

METALLIC UST INVESTIGATION: PARCEL 2 NCDOT PROJECT P-5705B (44475.1.2)

301 N. SMITH ST., CHARLOTTE, NC

SEPTEMBER 19, 2017

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C257: GEOLOGY

C1251: ENGINEERING

GEOPHYSICAL INVESTIGATION REPORT
Parcel 2 – 301 N. Smith St.
Charlotte, Mecklenburg County, North Carolina

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LIST OF ACRONYMS

CADD	Computer Assisted Drafting and Design
DF	Dual Frequency
EM.....	Electromagnetic
GPR.....	Ground Penetrating Radar
GPS	Global Positioning System
NCDOT.....	North Carolina Department of Transportation
ROW	Right-of-Way
UST	Underground Storage Tank

EXECUTIVE SUMMARY

Project Description: Pyramid Environmental conducted a geophysical investigation for the North Carolina Department of Transportation (NCDOT) at Parcel 2, located at 301 N. Smith St., Charlotte, NC. The survey was part of an NCDOT Right-of-Way (ROW) investigation (NCDOT Project P-5705B). The survey was designed to include the locations of at least four suspected USTs identified by a previous geophysical survey (General Engineering and Environmental, Inc. report, dated December 22, 2005) as well as the immediate surrounding area. Conducted from August 26-27, 2017, the geophysical investigation was performed to determine if unknown, metallic underground storage tanks (USTs) were present beneath the survey area.

Geophysical Results: The geophysical investigation consisted of electromagnetic (EM) induction-metal detection and ground penetrating radar (GPR) surveys. A total of five EM anomalies were identified. Several of the EM anomalies were associated with visible cultural features. Three EM features were further investigated by GPR.

GPR provided evidence of two discreet lateral reflectors in the northwest portion of the survey area that were suggestive of USTs. The combined geophysical data resulted in these features being classified as two possible metallic USTs (center point of north UST: 1448805, 544987; center point of south UST: 1448774, 544952; North Carolina State Plane NAD83, feet). The north possible UST was approximately 9 feet long and 5 feet wide, at a depth of 1.5 - 2.0 feet below the ground surface. The south possible UST was approximately 12 feet long and 6 feet wide, at a depth of 1.0 - 1.5 feet below the ground surface. Additional GPR provided evidence of possible buried debris and/or a utility at the northwest boundary of the survey area.

Collectively, the geophysical data recorded evidence of two possible metallic USTs at Parcel 2.

INTRODUCTION

Pyramid Environmental conducted a geophysical investigation for the North Carolina Department of Transportation (NCDOT) at Parcel 2, located at 301 N. Smith St., Charlotte, NC. The survey was part of an NCDOT Right-of-Way (ROW) investigation (NCDOT Project P-5705B). The survey was designed to include the locations of at least four suspected USTs identified by a previous geophysical survey (General Engineering and Environmental, Inc. report, dated December 22, 2005) as well as the immediate surrounding area. Conducted from August 26-27, 2017, the geophysical investigation was performed to determine if unknown, metallic underground storage tanks (USTs) were present beneath the survey area.

The site included a gravel parking lot with several parking barriers. An aerial photograph showing the survey area boundaries and ground-level photographs are shown in **Figure 1**.

FIELD METHODOLOGY

The geophysical investigation consisted of electromagnetic (EM) induction-metal detection and ground penetrating radar (GPR) surveys. Pyramid collected the EM data using a Geonics EM61 metal detector integrated with a Trimble AG-114 GPS antenna. The integrated GPS system allows the location of the instrument to be recorded in real-time during data collection, resulting in an EM data set that is geo-referenced and can be overlain on aerial photographs and CADD drawings. A boundary grid was established around the perimeter of the site with marks every 10 feet to maintain orientation of the instrument throughout the survey and assure complete coverage of the area.

According to the instrument specifications, the EM61 can detect a metal drum down to a maximum depth of approximately 8 feet. Smaller objects (1-foot or less in size) can be detected to a maximum depth of 4 to 5 feet. The EM61 data were digitally collected at approximately 0.8-foot intervals along north-south trending or east-west trending, generally parallel survey lines, spaced five feet apart. The data were downloaded to a

computer and reviewed in the field and office using the Geonics NAV61 and Surfer for Windows Version 14.0 software programs.

GPR data were acquired across select EM anomalies on August 27, 2017, using a Geophysical Survey Systems, Inc. (GSSI) UtilityScan DF unit equipped with a dual frequency 300/800 MHz antenna. Data were collected both in reconnaissance fashion as well as along formal transect lines across EM features. The GPR data were viewed in real-time using a vertical scan of 512 samples, at a rate of 48 scans per second. GPR data were viewed down to a maximum depth of approximately 6 feet, based on dielectric constants calculated by the DF unit in the field during the reconnaissance scans. GPR transects across specific anomalies were saved to the hard drive of the DF unit for post-processing and figure generation.

Pyramid’s classifications of USTs for the purposes of this report are based directly on the geophysical UST ratings provided by the NCDOT. These ratings are as follows:

Geophysical Surveys for Underground Storage Tanks on NCDOT Projects			
High Confidence	Intermediate Confidence	Low Confidence	No Confidence
Known UST Active tank - spatial location, orientation, and approximate depth determined by geophysics.	Probable UST Sufficient geophysical data from both magnetic and radar surveys that is characteristic of a tank. Interpretation may be supported by physical evidence such as fill/vent pipe, metal cover plate, asphalt/concrete patch, etc.	Possible UST Sufficient geophysical data from either magnetic or radar surveys that is characteristic of a tank. Additional data is not sufficient enough to confirm or deny the presence of a UST.	Anomaly noted but not characteristic of a UST. Should be noted in the text and may be called out in the figures at the geophysicist’s discretion.

DISCUSSION OF RESULTS



Discussion of EM Results

A contour plot of the EM61 results obtained across the survey area at the property is presented in **Figure 2**. Each EM anomaly is numbered for reference in the figure. The following table presents the list of EM anomalies and the cause of the metallic response, if known:

LIST OF METALLIC ANOMALIES IDENTIFIED BY EM SURVEY

Metallic Anomaly #	Cause of Anomaly	Investigated with GPR
1	Reinforced wall	
2	Two possible USTs	☑
3	Suspected debris	☑
4	Storm drain/beams	
5	Utility vault	

Several of the EM anomalies were the result of known cultural features including a reinforced wall, a storm drain, metal beams, and a utility vault. However, EM Anomalies 2 (which included two separate features) and 3 were associated with unknown buried metal, and were investigated further by GPR.

Discussion of GPR Results

Figure 3 presents the locations of the formal GPR transects performed at the property, as well as the transect images. A total of five GPR transects were performed at the site. GPR Transects 1 - 2 and 4 - 5 were performed across the two EM features associated with Anomaly 2. These transects recorded discreet lateral reflectors that could be associated with USTs. The combined geophysical data result in these features being classified as two possible USTs (center point of north UST: 1448805, 544987; center point of south UST: 1448774, 544952; North Carolina State Plane NAD83, feet). The north possible UST was approximately 9 feet long and 5 feet wide, at a depth of 1.5 - 2.0 feet below the ground surface. The south possible UST was approximately 12 feet long and 6 feet wide, at a depth of 1.0 - 1.5 feet below the ground surface.

Figure 4 presents the locations of the possible USTs on an aerial photograph along with ground-level photographs.

GPR Transect 3 was performed across Anomaly 3 at the northwest boundary of the survey area. This transect recorded a small, isolated lateral reflector and a small discreet hyperbolic reflector that suggested possible buried debris and/or a utility/conduit. No

evidence was recorded that suggested a larger structure such as a UST was present at this location.

Collectively, the geophysical data recorded evidence of two possible metallic USTs at Parcel 2.

Figure 5 provides an overlay of the geophysical survey area and the possible USTs onto the NCDOT MicroStation engineering plans for reference.

SUMMARY & CONCLUSIONS

Pyramid's evaluation of the EM61 and GPR data collected at Parcel 2 in Charlotte, North Carolina, provides the following summary and conclusions:

- The EM61 and GPR surveys provided reliable results for the detection of metallic USTs within the accessible portions of the geophysical survey area.
- Several of the EM anomalies were associated with visible cultural features. Three EM features were further investigated by GPR.
- GPR provided evidence of two discreet lateral reflectors in the northwest portion of the survey area that were suggestive of USTs. The combined geophysical data resulted in these features being classified as two possible metallic USTs (center point of north UST: 1448805, 544987; center point of south UST: 1448774, 544952; North Carolina State Plane NAD83, feet).
- The north possible UST was approximately 9 feet long and 5 feet wide, at a depth of 1.5 - 2.0 feet below the ground surface. The south possible UST was approximately 12 feet long and 6 feet wide, at a depth of 1.0 - 1.5 feet below the ground surface.
- Additional GPR provided evidence of possible buried debris and/or a utility at the northwest boundary of the survey area.
- Collectively, the geophysical data recorded evidence of two possible metallic USTs at Parcel 2.

LIMITATIONS


Geophysical surveys have been performed and this report was prepared for the NCDOT in accordance with generally accepted guidelines for EM61 and GPR surveys. It is generally recognized that the results of the EM61 and GPR surveys are non-unique and may not represent actual subsurface conditions. The EM61 and GPR results obtained for this project have not conclusively determined the definitive presence or absence of metallic USTs, but the evidence collected is sufficient to result in the conclusions made in this report. Additionally, it should be understood that areas containing extensive vegetation, reinforced concrete, or other restrictions to the accessibility of the geophysical instruments could not be fully investigated.



APPROXIMATE BOUNDARIES OF GEOPHYSICAL SURVEY AREA

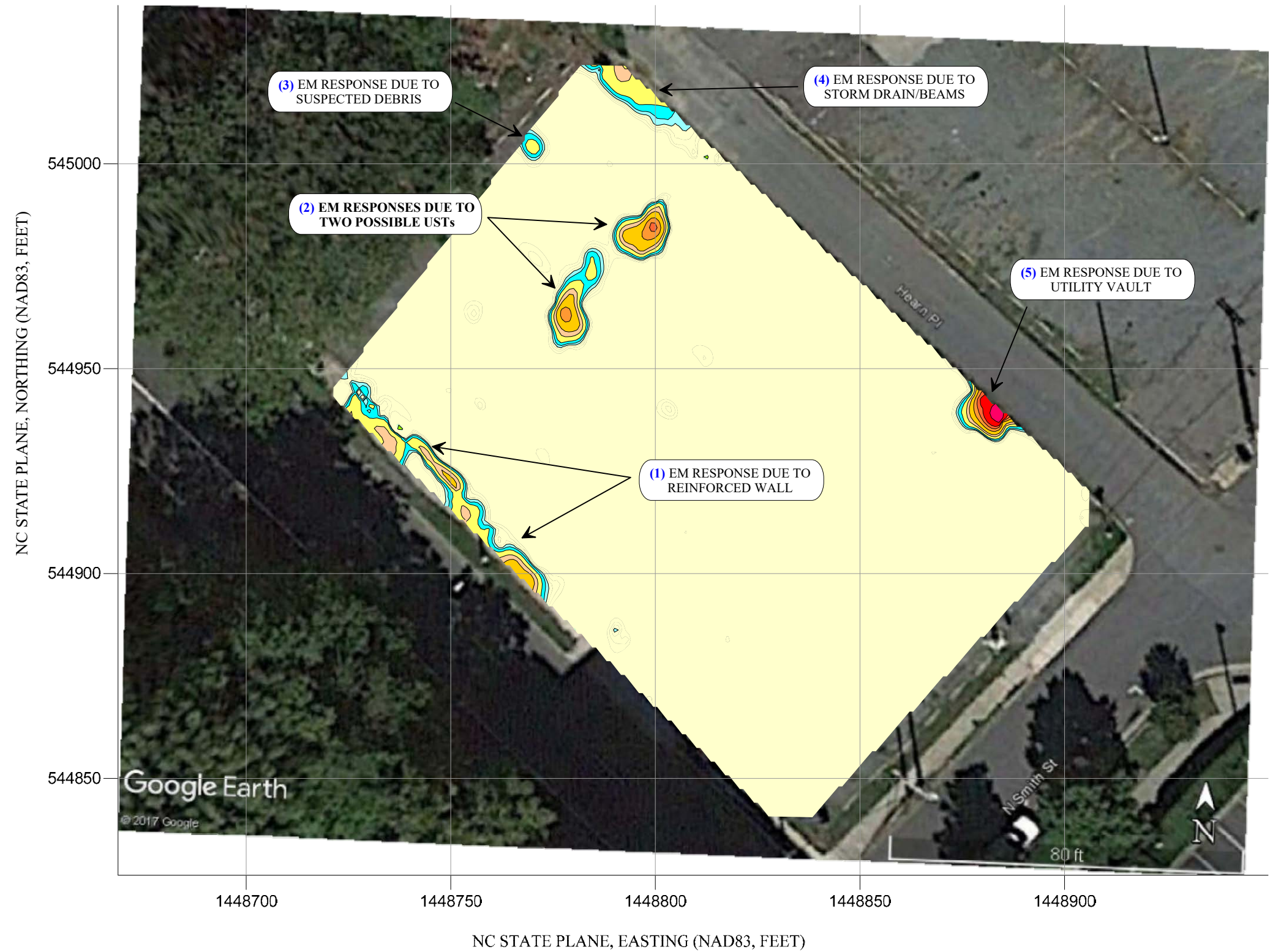


View of Survey Area
(Facing Approximately Northwest)

TITLE PARCEL 2 - GEOPHYSICAL SURVEY BOUNDARIES AND SITE PHOTOGRAPHS	
PROJECT PARCEL 2 NCDOT PROJECT P-5705B (WBS 44475.1.2) CHARLOTTE, NORTH CAROLINA	
<div><div>503 INDUSTRIAL AVENUE GREENSBORO, NC 27460 (336) 335-3174 (p) (336) 691-0648 (f) License # C1251 Eng. / License # C257 Geology</div></div>	
DATE 9/13/2017	CLIENT NCDOT
PYRAMID PROJECT #: 2017-253	FIGURE 1



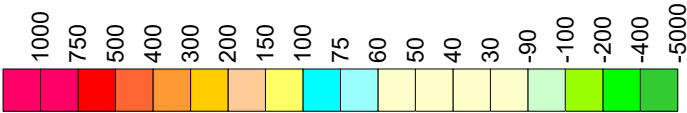
EM61 METAL DETECTION RESULTS




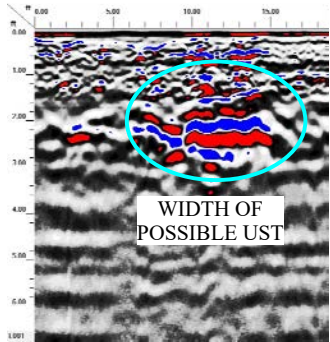
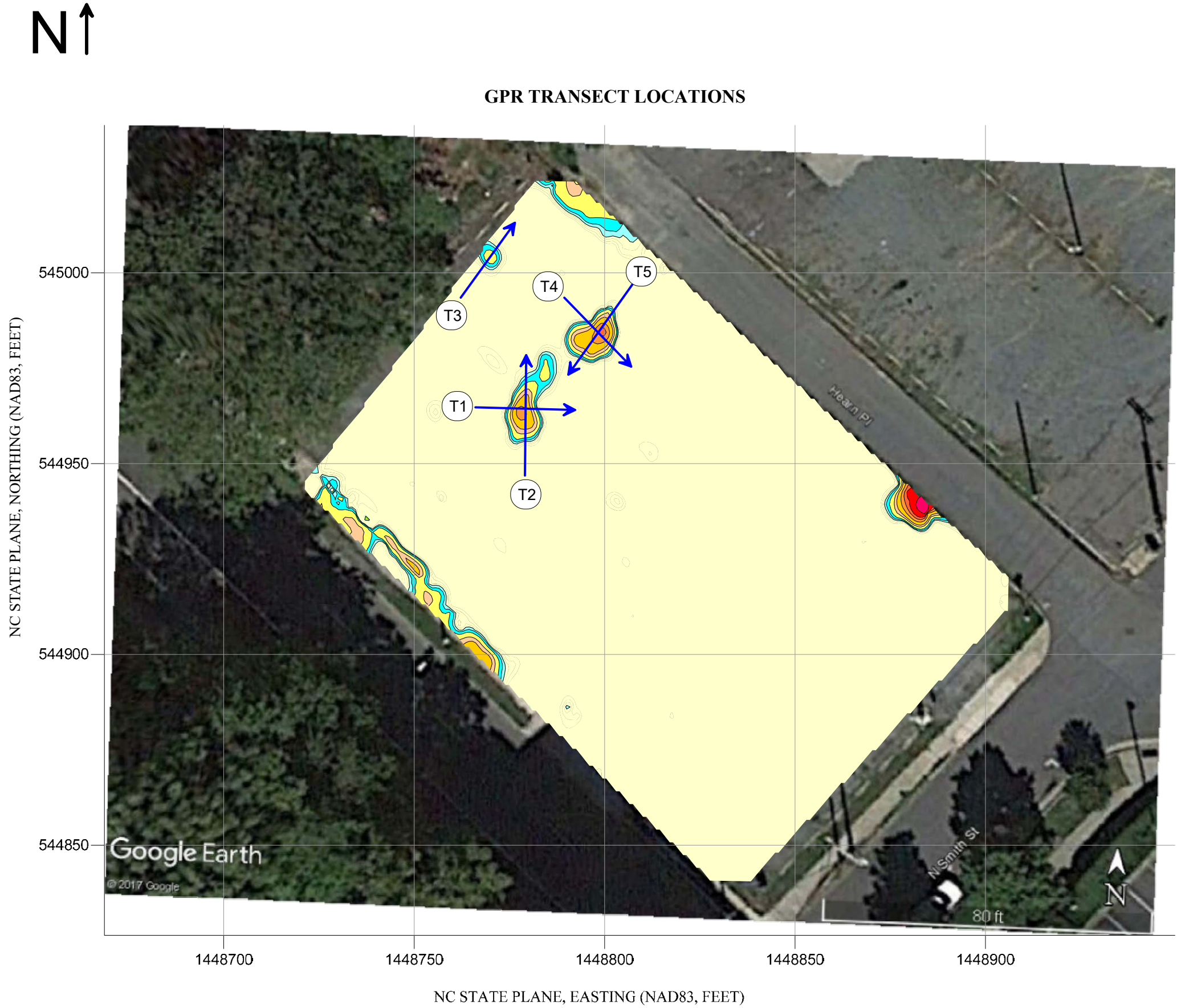
EVIDENCE OF TWO POSSIBLE METALLIC USTs OBSERVED.

The contour plot shows the differential results of the EM61 instrument in millivolts (mV). The differential results focus on larger metallic objects such as USTs and drums. The EM61 data were collected on August 26, 2017, using a Geonics EM61 instrument. Verification GPR data were collected on August 27-29, 2017, using a GSSI UtilityScan DF unit with a dual frequency 300/800 MHz antenna.

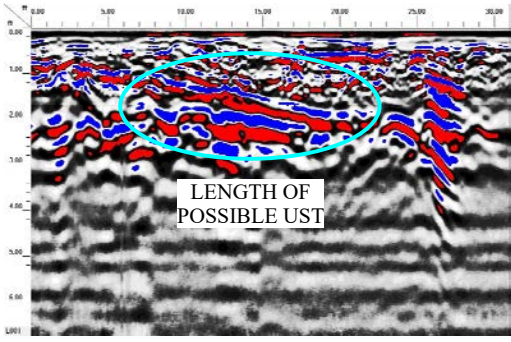
EM61 Metal Detection Response (millivolts)



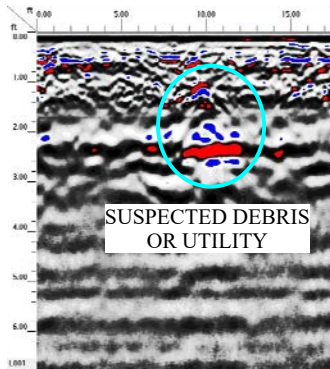
TITLE		PARCEL 2 - EM61 RESULTS CONTOUR MAP	
PROJECT		PARCEL 2 NCDOT PROJECT P-5705B (WBS 44475.1.2) CHARLOTTE, NORTH CAROLINA	
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DATE	9/13/2017	CLIENT	NCDOT
PYRAMID PROJECT #:	2017-253	FIGURE 2	



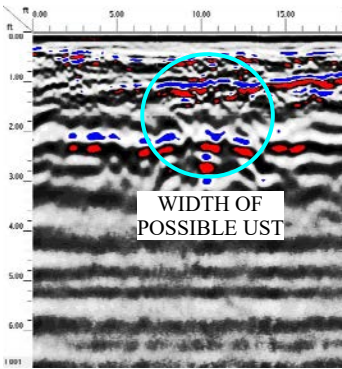
GPR TRANSECT 1 (T1)



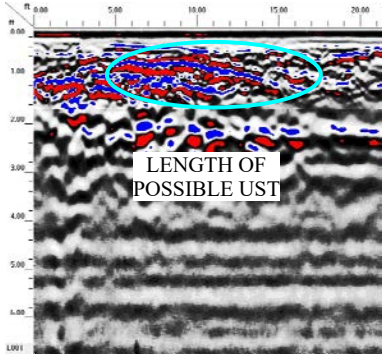
GPR TRANSECT 2 (T2)




GPR TRANSECT 3 (T3)



GPR TRANSECT 4 (T4)



GPR TRANSECT 5 (T5)

TITLE		PARCEL 2 - GPR TRANSECT LOCATIONS AND IMAGES	
PROJECT		PARCEL 2 NCDOT PROJECT P-5705B (WBS 44475.1.2) CHARLOTTE, NORTH CAROLINA	
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DATE	9/13/2017	CLIENT	NCDOT
PYRAMID PROJECT #:	2017-253	FIGURE 3	




LOCATIONS OF POSSIBLE METALLIC USTs



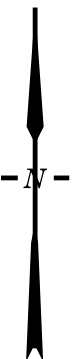
View of Possible UST #1
Facing Approximately Southwest




View of Possible UST #2
Facing Approximately Southeast

TITLE		PARCEL 2 - LOCATIONS AND SIZES OF POSSIBLE USTs	
PROJECT		PARCEL 2 NCDOT PROJECT P-5705B (WBS 44475.1.2) CHARLOTTE, NORTH CAROLINA	
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DATE	9/13/2017	CLIENT	NCDOT
PYRAMID PROJECT #:	2017-253	FIGURE 4	

 EXISTING ROW
 EXISTING PROPERTY BOUNDARY
 GEOPHYSICAL SURVEY AREA
 POSSIBLE METALLIC UST



<p>TITLE OVERLAY OF GEOPHYSICAL SURVEY BOUNDARIES AND LOCATION OF POSSIBLE USTs ON NCDOT ENGINEERING PLANS</p>	
<p>PROJECT PARCEL 2 NCDOT PROJECT P-5705B CHARLOTTE, NORTH CAROLINA</p>	
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  </div> <div style="text-align: right;"> <p>503 INDUSTRIAL AVENUE GREENSBORO, NC 27406 336.335.3174 (p) 336.691.0648 (f) License # C1251 Eng. / #C257 Geology</p> </div> </div>	
<p>DATE: 9-13-17</p>	<p>REVISION NO. 0</p>
<p>PYRAMID PROJECT NO. 2017-253</p>	<p>FIGURE NO. 5</p>